



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/599,689	10/05/2006	Tomoyuki Kume	KTM-16877	2871
40854	7590	12/23/2010		
RANKIN, HILL & CLARK LLP 38210 GLENN AVENUE WILLOUGHBY, OH 44094-7808				
EXAMINER				
VETTER, ROBERT A				
ART UNIT		PAPER NUMBER		
1712				
NOTIFICATION DATE		DELIVERY MODE		
12/23/2010		ELECTRONIC		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

40854@rankinhill.com  
spaw@rankinhill.com

### Office Action Summary

**Application No.**

10/599,689

**Applicant(s)**

KUME ET AL.

**Examiner**

ROBERT VETERE

**Art Unit**

1712

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 08 October 2010.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) 3 and 6 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 2, 4, 5 and 7 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-940)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB-08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Examiner's Comment***

An amendment, amending claim 2 and adding new claim 7, was received and entered on 10/8/10. Claims 3 and 6 remain withdrawn pursuant to an election made on 4/5/10.

### ***Response to Arguments***

1. Applicant's arguments filed 10/8/10 have been fully considered but they are not persuasive.

Applicant argues that the amendment to claim 2 overcomes the rejection of claims 2 and 5 under § 112, 2<sup>nd</sup> paragraph. This is not persuasive. Claim 1 recites, in the third heating step, "... while causing the hydrogen selenide gas introduced up to the second selenization step to remain in the space."

Currently amended claim 2 states that, in the second heating step, the hydrogen selenide gas is removed and additional hydrogen selenide gas is introduced. This is not possible because claim 1 requires that the gas introduced in the first heating step remains in the space. Replacing the gas which is removed does not overcome the determination of indefiniteness.

Applicant also argues that Eberspacher fails to teach or suggest the use of hydrogen selenide gas and instead teaches the use of inert gas. This is not persuasive. Eberspacher teaches that hydrogen selenide gas is used along with an inert gas at 4:29-31 to improve device quality.

Applicant further argues that Hedstrom is not relevant to the present case because Hedstrom teaches a PVD method which is not equivalent to the current method. This is not persuasive. While Hedstrom is directed to a PVD method of forming a CIS layer for a photovoltaic cell rather than a sputter method, the teaching in Hedstrom that a rotating cabinet will yield a uniform absorber layer is relevant to a variety of methods of producing CIS and CIGS absorber layers. See, e.g., USP 5,728,231 which also teaches the use of a rotating substrate holder when forming a CIS layer using a sputtering method in order to achieve a uniform coating. Thus, one of ordinary skill in the art would have understood that the motivation to use a rotating chamber provided by Hedstrom was relevant to the combination of Kushiya and Eberspacher.

### ***Claim Rejections - 35 USC § 112***

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

Art Unit: 1712

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 2 and 5 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 2 states that the second selenization step includes an evacuating step of evacuating the interior of the airtight space. However, Claim 1 requires, in the third selenization step, that all the hydrogen selenide gas introduced up to the second selenization step remains in the space. Thus, Claim 2 contradicts the limitations of claim 1 and is, therefore, indefinite.

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kushiya et al. (US 5,981,868) in light of Eberspacher et al. (US 5,045,409) and Basol et al. (US 5,028,274).

**Claim 1:** Kushiya teaches a method of forming a light absorbing layer for chalcopyrite type solar cells (Abst.) comprising the steps of depositing, by sputtering, a layer of indium and a layer of copper-gallium alloy on an electrode and selenizing the deposited layer (4:28-35). However, Kushiya fails to expressly teach the selenization conditions employed.

Eberspacher teaches a method of selenizing layers chalcopyrite type layers in a solar cell wherein the selenization is carried out by introducing hydrogen selenide into the chamber and raising the temperature from about 200°C to about 550°C and cooling the layers (4:7-44). As a result of this disclosure, Eberspacher implicitly teaches that the selenization process heats the substrate to each of the three claimed temperature ranges. Thus, because Kushiya is silent regarding the means employed to selenize the layers and because Eberspacher teaches that heating the layers to 550°C in the presence of hydrogen selenide is a suitable means of selenizing chalcopyrite type layers in a solar cell, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have heating the

Art Unit: 1712

layers according to the method disclosed by Eberspacher in the method of Kushiya with the predictable expectation of success.

With respect to the indium layer being deposited on the electrode, Basol explains that the deposition sequence of indium and copper-gallium alloy layers can be adjusted and that indium can be deposited on the electrode with copper-gallium deposited on the indium layer in a chalcopyrite type solar cell (8:12-41). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have deposited the indium layer first because Basol teaches that either order of deposition is suitable for chalcopyrite type solar cells.

With respect to the limitation that the space is airtight, the examiner takes official notice that hydrogen selenide is a highly toxic gas and further that it is well known to contain toxic gases in an airtight space for the safety of those working with the gas. Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used an airtight space in order to have prevented exposure to the toxic gas.

**Claim 7:** While Kushiya, Eberspacher and Basol fails to expressly stated that the first heating step preheats, the second heating step causes diffusion and the third heating step causes recrystallization, the combined method of Kushiya, Eberspacher and Basol teach the same process steps and compounds as those taught by applicant. Thus, it is inherent that the heating steps performed in the combined method of Kushiya, Eberspacher and Basol correlate to preheating, diffusing and recrystallizing.

5. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kushiya, Eberspacher and Basol in light of Hedström (US 5,445,973).

**Claim 4:** Kushiya fails to expressly state the configuration of the substrate in the chamber. However, Hedström teaches a method of forming a chalcopyrite type solar cell wherein the substrate is positioned in a chamber on a rotatable device (Abst.) and wherein the substrate is rotated during selenization in order to ensure that the coating is uniform (3:61-68). While Hedström fails to expressly state that the substrate is almost upright, Hedström teaches that the substrate is rotated about an axis and, therefore, implicitly teaches that the substrate will be almost upright during the course of its rotation.

Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided the substrate on a rotatable holder, as taught by Hedström, in the method of Kushiya in order to have ensured a uniform selenization.

***Conclusion***

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ROBERT VETERE whose telephone number is (571)270-1864. The examiner can normally be reached on Mon-Fri 9-6.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on 571-272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Art Unit: 1712

/Robert Vetere/  
Examiner, Art Unit 1712

/David Turocy/  
Primary Examiner, Art Unit 1715